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Cladoniae of the North Woods

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This paper is an extension of an earlier article, "Cladoniae of the Range of the Torrey Botanical Club," published in the September-October, 1933 number of Torreya. It covers species found by the writer, or received from friends who kindly volunteered to collect them, in the Adirondacks, Vermont, New Hampshire, Maine, and Gaspé, in eastern Quebec. It also includes some species listed in books and papers which will be cited, but which were not seen nor received by the writer, but are listed to suggest that they be looked for in favorable locations in the region here covered.

This paper includes many of the species, described in the earlier paper, which extend their ranges into the more northern regions here covered, but, since they were described, and in many cases pictured, in the earlier paper, they are noted in less detail here, in order to save space for a more complete record of species that may be sought in the North Woods. Readers are referred to the key and habitat notes of the earlier paper, and to the authorities there cited for more detailed descriptions.

The three plates at the end of this paper are devoted largely to North Woods species, except a few, where the strikingly robust character of species common to both regions, but larger in the north, seemed to warrant inclusion in the illustrations.

This paper is intended, like the earlier one, as the contribution of an amateur student of lichens to beginners like himself, and may perhaps be of particular use to nature councillors in summer camps in the North Woods, who may include lichens in their educational work, under the stimulus of recent papers on Cladoniae, by experts, in botanical journals, which have aroused new interest among amateur botanists in this hitherto relatively neglected class of plants. Teachers, students, walkers

and climbers interested in botany, whose vacations take them into the North Woods, will find there many species of Cladoniae which are absent or rare in the range of the Club within 100 miles of New York City. Some of these northern species are strikingly tall and robust, compared with those of lower latitudes, and others are extreme in their fantastic and intricate forms of branching.

Thanks are due to the friends who volunteered to collect and send to the writer ample specimens, found on their vacation trips, in the North Woods. Specimens from Gaspé, Quebec, along the north shore and in the Gaspé National Forest, near the Federal Zinc and Lead Mine, 48 miles inland from the Bay of Chaleur on the south shore, and from Maine and New Hampshire, were collected by the writer; on a trip made possible by Mr. Alexander Jessup, who supplied transportation in his automobile; and in the Adirondacks, through similar helpfulness by Mr. LeRoy E. Kimball. Those who sent specimens were as follows:

Mr. George F. Dillman, from Schroon Lake, Santanoni Mountain, Hurricane Mountain and Mount McIntyre, in the Adirondacks; Mr. Archibald F. Shorey, from the Great Range and Cranberry Lake, in the Adirondacks; Mr. John W. Thomson, Jr., from western Maine; Mr. Frederick K. Vreeland, from South Pond, near Long Lake, and Blue Mountain, in the Adirondacks; Mr. Vincent Schaefer, of Schenectady, N. Y. from Panther Gorge on Mount Marcy, Adirondacks; Mr. Myron H. Avery and Dr. J. F. Schairer, of Washington, D. C. from Mount Katahdin and Chairback Mountain, northern Maine; Mr. E. H. Walker, of the Smithsonian Institution, Washington, D. C., from Mount Washington, N. H.; Mr. M. L. Joslin, of Burlington, Vt., from Lincoln Mountain, Couching Lion and other Green Mountain summits, in Vermont; and Mrs. Laura Woodward Abbott, of Bristol, Pa., from Jay Peak, Vermont.

Acknowledgments are again due to Dr. Alexander W. Evans, of the Osborn Botanical Laboratory, Yale University, Professor of Botany, for continued helpfulness in the determination of these northern species; and, in some cases, for confirmations or precise determinations by Dr. Heinrich Sandstede, of Bad Zwischenahn, Oldenburg, Germany, to whom Dr. Evans sent

some of the material. Dr. Evans has supplied notes on many stations of species, from specimens in the herbarium in the Osborn Botanical Laboratory, and from other records, establishing their occurrences more widely than was known to this writer, especially of the extension northward of the range of species reported in the paper on the "Cladoniae of the Range of the Torrey Botanical Club."

Use has been made of the authorities cited in the first paper; Prof. Bruce M. Fink's "Lichens of Minnesota;" Prof. Edward Tuckerman's "Synopsis of North American Lichens;" Annie Lorain Smith's "Manual of British Lichens;" Dr. A. W. Evans' "Cladoniae of Connecticut," and the supplement thereto in the July-August, 1932 issue of Rhodora, journal of the New England Botanical Society. Two additional lists of northern Cladoniae, kindly called to our attention by Dr. Evans, have been found very useful in checking species: "Cladoniae from the Valley of the Cap Chat, Gaspé Peninsula, Quebec," by A. F. Allen, in the May, 1930 issue of Rhodora; and part of an article on "Lichens of the Gaspé Peninsula," in the instalment covering the Cladoniae, in the October, 1926 issue of Rhodora, by Dr. C. W. Dodge. These papers will be found very useful by any students of Cladoniae who may be able to reach the higher summits of the Shickshock Mountains in the interior of the peninsula, which has been made more accessible in recent years by the completion of the automobile highway around the north shore, making the region an attractive one for summer vacation botanizing tours.

Dr. Evans has also added to the information of this writer through references from a paper by Merrill, the 12th of his series of Lichen notes, which appeared in the Bryologist, journal of the Sullivant Moss Society, for September, 1909, entitled "The Cladonia specimens of 'Lichenes Boreali-Americani.' "

Many of the species given in the key in this article are not listed in the older American works on lichens, and some of them are not found in any readily accessible reference works, but were identified by Dr. Evans, according to names now generally accepted, from the universal treatment of Cladoniae, by Professor Edward August Vainio, the distinguished Finnish authority, of whose work there are very few copies in this country. The popular treatment here offered may therefore be justified in

order to place a brief, compact and inexpensive means of identification of these northern species, upon characters observable with the naked eye or a hand lens, in the hands of students who are becoming interested in lichens as an extension of general botany, on their rambles and vacation trips.

The distribution of Cladoniae, as observed by this writer, from New Jersey to Gaspé, and from sea level to over 5,000 feet, in the regions in which he has collected, suggests that they are affected by the factors that influenced the migration of vegetation northward after the close of the last period of glaciation in North America, 30,000 to 50,000 years ago. Like alpine and arctic flowering plants, they retreated northward, and in many cases retreated upward to higher elevations in the areas first uncovered by the melting of the ice sheet, where they are now isolated on boreal islands. Northern species, such as *Cladonia deformis*, still remain on some of the higher mountains in the club range, as in the Catskills. Dr. Evans, in his "Cladoniae of Connecticut" reports the collection, in the highest parts of that state, in the northwestern townships in the Taconic mountains, of Cladoniae not found elsewhere in the state, but commoner in northern New England. Many of the species common in the club range appear to be extending into the North Woods, and a recent discovery by the writer, in the Pine Barrens of southern New Jersey, of *Cladonia santensis*, hitherto reported no farther north than Maryland and originally determined from South Carolina on the Santee Canal, suggests a migration of southern forms northward along the coast strip, as occurs with flowering plants. But some of the species here listed from the North Woods have not been reported in the Club range, although they may be left islanded on some of the higher summits of the Blue Ridge or the Great Smokies, above 4,000 feet.

Readers are referred to the earlier paper by the writer, for the morphology of the genus Cladonia, or, for more detail and technical treatment, to the authorities there cited.

Key to Groups and Species

In this key, species listed in the earlier paper by this writer, as of the range of the Torrey Botanical Club, extending only as far north as the Catskills and Taconics, which have been

found by the writer in the northern regions here covered, or sent to him by others, are described briefly to keep the continuity of the systematic arrangement of the genus. Readers are referred to the earlier paper, and to the authorities there cited, for fuller descriptions. Species not listed in the earlier paper are described more fully here. In the photographs at the end of this paper the illustrations are confined to the species not previously pictured, except a few cases where robust forms of the north woods, of species found in the club range, are presented. The list here presented is not a complete one for the region, and many of the species of the club range not found there in or received therefrom, by the writer, doubtless extend northward, and further search would disclose them. Northern species ward along the mountains, probably even south of the Torrey Botanical Club range, and southern, or Middle Atlantic coastal plain species, found in the New Jersey Pine Barrens or on Long Island, probably extend into southern Maine, or perhaps into Nova Scotia, through migration along the now submerged Continental Shelf.

Subgenus 1. **Cladina** (Nyl) Vain. Primary thallus crustaceous, soon disappearing, rarely seen. Podetia slender, one to six inches tall, or taller still farther north; much branched, arachnoid-tomentose, without cortex, or with a close or scattered warty surface of gonidia (tuberculous masses of algal cells); tips of branches with two to eight minute forks, usually brownish; apothecia small, circular, rare, brown. Usually densely branched and entangled, often in large colonies, sometimes two or more species in the same colony. Grayish, grayish-white, or grayish green, or bright green in shade or olive-brown in sun. Commonly known as "Reindeer Mosses."

Podetia in dense, irregularly entangled colonies.
Podetia often polytomous (many-branched) with whorls of three or more branches surrounding gaping axils; outer podetial layers persistent.
Podetia ashy-gray, darker in old plants; or sometimes brownish or greenish; surface arachnoid, KOH+, yellowish.

1. *C. rangiferina*

Podetia yellowish-green, varying to gray, whitish or greenish, more delicate than the preceding, KOH−; frequent sub-secund (on one side) branches between the whorls of branches on the main axes; outer branches often curving in one direction, apices nodding, tips 3–8 pointed; gonidia grayish, greenish or brownish, interspaces tomentose. (Pl. 1, f. 2.)

2. *C. sylvatica*

Podetia sometimes whorled throughout along the main axes, or with occasional single branches between whorls; peripheral branches upright, or in older plants curving or nodding, with ultimate branches in clusters of three or more, sometimes distinctly parallel, podetial surface smooth, or in older plants verruculose (with minute warts).

3. *C. mitis*

Podetia rarely polytomous, and usually dichotomous, (two-forked), straw colored, greenish or brownish.
KOH + pale yellow; outer podetial layers persistent, monopodial (single-stemmed) appearance clear in large axes; podetial surface smooth, or rough in older plants.

4. *C. tenuis*

KOH − monopodial appearance not so definite, podetia irregularly branched or subdichotomously divided, podetial surface rough with disintegrating gonidia as plant matures, gonidia greenish, yellowish or whitish, darkening.

5. *C. impexa*

Podetia in regular, smooth, compact colonies, plant masses often with an even, curving top, the podetia being all of nearly equal length; polytomous (many-branched), with whorls of branches around gaping axils, whitish or pale gray; KOH −, outer podetial layers often disintegrating, surfaces arachnoid. Distinctive because of the smoothly rounded masses. (Pl. 1, f. 1.)

6. *C. alpestris*

Subgenus 2. **Pycnothelia**. Ach. Primary thallus granular-crustaceous, persistent. Podetia short, ⅛ inch to one inch tall, stout, simple or short-branched, terminating in blunt tips. Apothecia small, brownish-red. "Resembling minute cacti."

7. *C. papillaria*

Subgenus 3. **Cenomyce** (Ach.) Th. Fr. Primary thallus foliaceous (with leaf-like squamules), persistent, or sometimes disappearing.

Series A. Cocciferae Del. Apothecia scarlet or rarely flesh-colored or whitish in some color forms.

a. Subglaucescentes Vainio. Primary squamules grayish green above, white beneath, podetia whitish to grayish-green, sometimes fertile with rather small scarlet apothecia, or sterile with blunt or pointed apices, mostly decorticate (without a definite outer cortex), decorticate areas farinose-sorediate or granulose.

Podetia usually basally corticate, but with the cortex usually discontinuous above, below apices, KOH −.

8. *C. Floerkeana*

Podetia sometimes basally corticate, but above wholly decorticate, and farinose-sorediate, KOH −.

9. *C. bacillaris*

KOH + yellow.

10. *C. macilenta*

These three species, together with *C. didyma* (listed in the earlier paper, but not here, although it may extend into northern New England), look much alike on casual observation, and often grow together, in the club range. *C. macilenta* is definitely distinguishable, even if the other characters are doubtful, by the instant yellow reaction with KOH. *C. didyma* has a less brilliant yellow reaction, but is distinguishable from *C. macilenta* by its usually lower and stouter form. *C. bacillaris* and *C. Floerkeana* are distinguishable by their taller, slenderer form, and absence of KOH reaction, as between each other they are sometimes doubtfully separable, and some lichenists question if they are separate species.

b. Stramineo-Flavidae Vainio. Primary squamules yellowish-green above, white or yellowish beneath, podetia yellowish-green.

Podetia cup-forming, sterile or fertile, (CaCl) KOH + pale yellow. Cortex persistent, not sorediate.

11. *C. coccifera*

Cortex distintegrating, usually sorediate, KOH −. Apothecia often rather large and conspicuous.

12. *C. pleurota*

Cortex persistent below, disintegrating above, cups with many sharp-pointed marginal divisions, usually incurved, with small apothecia on tips KOH + yellow. (Pl. 1, f. 3.)

13. *C. digitata*

Cortex continuous or rimose (chinky), lower part sometimes squamulose, cortex often yellow-sorediate, margins of cups often irregularly dentate or proliferate, podetia tallest of our red fruited Cladoniae, sometimes over three inches under favorable conditions in the north. KOH −. (Pl. 1, f. 5.)

14. *C. deformis*

Podetia not cup-forming, always terminated by apothecia; cortex continuous or areolately dispersed, or absent, KOH −. Plants not sorediate; podetia variously branched in several different forms, decorticate areas whitish, arachnoid. (Pl. 1, f. 4.)

15. *C. cristatella*

Plants more or less sorediate, podetia simple, club-shaped, decorticate areas naked; in one form the podetia are densely squamulose and sorediate and apothecia degenerate in size or wanting. KOH −.

16. *C. incrassata*

Series B. Ochrophaeae. Vainio. Apothecia brown to flesh color.

a. Unciales. (Del) Vainio. Primary thallus foliose, disappearing, seen only in young plants. Podetia not persistent at base, cylindrical to irregularly swollen, usually corticate, never squamulose, becoming much branched

and intertangled, *apices spinose*, which distinguishes this group from the Cladinae, which they resemble in massed habit and with which they often occur. The smooth cortex of the Unciales (except in C. Boryi), also distinguish them from the usually rough surfaced Cladinae. One to four inches high, dwarfed in alpine or exposed situations.

Podetia smooth and firm on surface, yellowish-gray to brownish-green, with axillary or internodal perforations in older plants, both sterile and fertile, with small brown apothecia, constructed at base, cupless.

17. *C. uncialis*

Podetia smooth, yellowish gray to pale yellowish green, in some forms bearing shallow cups, axillary perforations on fertile plants but rare on sterile.

18. *C. caroliniana*

Podetia delicate in surface, tending to be decorticate, dull ashy gray, often quite stout, up to 8 millimetres in diameter, older plants with reticulate or perforated surfaces and bearing conspicuous cups with perforated membranes, axillary perforations numerous.

19. *C. Boryi*

Podetia much branched, arising from branches or free fragments of dying podetia, or rarely from primary squamules, sub-cylindrical, cupless or sometimes cup-bearing, forming large or small clusters, cortex continuous or areolate, rarely squamulose at base, straw-colored or greenish, basal dead portions scarlet, apices brownish, subulate and sterile, or rarely terminated by small, abruptly dilated perforate cups, margins frequently spinulose or radiately lacerate or proliferous, apothecia solitary or clustered, sometimes perforate or lobate, brick red or brownish.

20. *C. amaurocraea*

b. Chasmariae (Ach.) Floerke. Primary squamules persistent or disappearing, white beneath. Podetia usually persistent basally, cupless or with *open cups*, not closed by a diaphragm, axils usually open.

Primary squamules largest of North American Cladoniae, with broad, rounded lobes, stout, branching podetia, with sterile subulate tips, or bearing small cups, simple or proliferous, rarely fruiting; faint yellow reaction with KOH. (Pl. 3, f. 8.)

29. *C. turgida*

Primary squamules small to medium, with finely incised to crenate marginal divisions.

Podetia reduced to short stalks bearing apothecia, or the apothecia sessile on the primary squamules. KOH −.

28. *C. caespiticia*

Podetia well developed.

Podeita cup-forming, cups from small and simple to large and densely proliferate, cortex disintegrating. KOH −.

25. *C. squamosa*

Cups with punctured or lacerate membranes and proliferations much branched, sometimes bearing second or third ranks of cups, each still further proliferate; or with cups largely abortive or absent, but podetia widely branching. KOH −. (Pl. 3, f. 2.)

23. *C. multiformis*

Primary squamules smaller than in the last three species, podetia bearing cups with no or very slight closing membranes, or cupless, KOH −. (Pl. 2, f. 2.)

24. *C. crispata*

Primary squamules small, lobate or laciniate, podetia cylindrical and erect, with narrow, perforate cups, with incurved margins, often with several erect or suberect proliferations, which are pointed or tipped with small, narrow cups; or with larger proliferations bearing relatively large cups, sometimes again proliferate, giving a two or three ranked effect, and a total height of two or three inches. Podetia sorediate from apex downward, base usually corticate and sometimes squamulose. KOH −. (Pl. 2, f. 4,6,7.)

26. *C. cenotea*

Podetia not cup-forming.

Plants very small and delicate, on decaying wood, sorediate-granulose, cortex dispersed or wanting, podetia short, simple or branched. KOH + yellow.

27. *C. delicata*

Podetia much-branched, branches often dichotomous, slender and elongated, cortex continuous or areolate, apices often subulate, axis irregularly gaping, KOH −. Pinnately branching forms of this species may be mistaken for some of the Cladinae, since the Cladinae, the Unciales and forms of C. furcata may be found together. But the Cladinae have blunt tips, the Unciales sharp tips, and while some forms of C. furcata have subulate tips they are not as sharp as those of C. uncialis, and their branching is more loose and sprawling than that of the others, and they more often have an olive hue which distinguishes them in mixed colonies, from the gray or green tints of the others. Densely branching forms were described and pictured in the earlier paper; the northern form here illustrated, var. racemosa, f. furcatosubulata, is simpler. (Pl. 3, f. 6.)

21. *C. furcata*

Like C. furcata, but sorediose. (Pl. 3, f. 3.)

22. *C. scabriuscula*

c. Clausae. Vainio. Primary thallus persistent or disappearing, squamules white or creamy beneath. Podetia usually basally persistent, cupless, *or with closed cups*, axils closed. Podetia not intertangled, but growing separately by themselves, except where crowded, when they may be attached by intergrowths on the podetia or cups. This series includes the common

cupped forms, familiar to the most casual observer of lichens, known to children as "Fairy Cups."

Podetia cup-forming.
Plants neither sorediate nor granulose.
Cups regular.
Cups deep, usually with short marginal proliferations, cortex warty-areolate, with flat raised plates, or smooth.

36. *C. pyxidata*

Cups shallow, 2 to 5 ranked, centrally proliferate, diminishing in size above, surfaces smooth, with marginal proliferations into small cups, or bearing apothecia, or with smaller cups scattered over surfaces and marginal apothecia. Cortex smooth, squamulose near base in one form.

33. *C. verticillata*

Cups shallow, 1 to 5 ranked, dentate or proliferate, proliferations arising from the margin or center of the cup and either solitary or radiately arranged, podetia sometimes densely squamulose, apothecia regular or finally lobate and perforate, solitary or clustered at the apices of podetia or proliferations. (Pl. 1, f. 6.)

34. *C. degenerans*

Cups shallow, broad or narrow, regular or irregular, in 1 to 4 ranks, proliferate from the margins, cortex smooth, greenish, or brownish in older plants, apothecia marginal, sessile or on stipes. Some forms relatively low, 1 to 2 inches high; others, as in var. *elongata*, among the tallest of Cladoniae, up to five inches in height, with small narrow cups when young, enlarging and becoming irregular as the podetia elongate. KOH − except var. *elongata*, + yellow. (Pl. 2, f. 1.)

35. *C. gracilis*

Cupless, podetia slender, cylindrical, terminating in long, sharp-pointed, olive-tinted tips, sterile. Cortex smooth or slightly areolate.

42. *C. cornuta*

Plants sorediose, or granulose.
Cupless.
Podetia slender, simple or slightly branched, scatteringly sorediate, usually sterile.

41. *C. cornutoradiata*

Bearing cups, large or small.
Cups irregular, shallow, often one-sided, with only one rank of proliferations, usually fertile.

40. *C. nemoxyna*

Poedtia subulate or truncate with small, narrow cups, rarely fruiting, soredia farinaceous, squamules large and with lobate margins, cups sorediate inside. KOH+, brownish.

43. *C. coniocraea*

Same as above, but with subulate podetia more frequently bearing apothecia, cups when present as above, but smooth inside.

47. *C. ochrochlora*

Podetia cupless, or cup-forming, in material seen scarcely cup-forming, but with a slight dent at top of cylindrical podetia; resembling *C. coniocraea*, but distinguished by the presence of the bases of the podetia of outgrowths of an isidioid character, in the form of coarse granules or minute squamules, simple or sparingly lobed. KOH+ pale yellow, which also distinguishes the species from *C. coniocraea*, in which the reaction is brown.

44. *C. borbonica*

Cups deep and often large, simple, dentate or much varied by extensive and amply fruiting proliferations, either on stipes or smaller cups; granulate or more or less squamulose, in some forms densely so. KOH −.

37. *C. chlorophaea*

Like the above, but with farinose, rather than granular soredia; podetial cortex not verruculose as in *C. chlorophaea*, but with smooth, flat areoles.

38. *C. conista*

Like preceding, but with taller cups, sometimes covered with soredia, on inner and outer surfaces, KOH+ brownish. (Pl. 3, f. 7.)

39. *C. fimbriata*

Cups shallow and small, irregular, or usually lacking and replaced by subulate apices which are often fertile. KOH −.

45. *C. pityrea*

Podetia slender, cylindrical or sub-cylindrical, rarely abortively cup-bearing, simple or branched, solitary or in groups, erect or flexuous, cortex warty or with small areoles, sometimes squamulose toward base; cups when present in axils of branches, apothecia terminating all podetia, pale brown or flesh-colored. (Pl. 2, f. 3.)

48. *C. botrytes*

Primary squamules small, medium to large; podetia simple and club shaped, or with short branches.

Podetia grayish-green to olivaceous, cortex continuous to areolate, surface sometimes flattened or depressed.

Primary squamules somewhat erect and densely crowded, podetia naked or squamulose, CaCl (KOH) bluish green.

46. *C. strepsilis*

Podetia short and slender, or stout, obconic, usually somewhat branched, smooth or squamulose. KOH, + yellow, followed by brick red, the only Cladonia with this color reaction, positvely identifiable when it appears.

31. *C. subcariosa*

Podetia subcylindrical or thickened toward the top, always fertile, branching, sometimes even from the base, branches suberect or spreading, sides fissured or grooved, cortex subcontinuous or areolate, decorticate portions between the areoles white, apothecia clustered at tips of branches, frequently perforate, light, dark or reddish brown. KOH+ yellow. (Pl. 3, f. 5.)

30. *C. cariosa*

Podetia slender, cylindrical, "at length elongated, the fertile ones mostly simple but the sterile at length fastigiately branched," largely decorticate. KOH−. (Pl. 2, f. 5.)

32. *C. decorticata*

Forms of Species and Habitat Notes

1. *C. rangiferina* (L.) Web. In moss or thin soil over ledges, widely scattered and in dense colonies in favorable locations, found by writer along north shore of Gaspé; reported by A. F. Allen (Rhodora, Vol. 32, No. 377, page 91) in valley of Cap Chat River and on Mount Logan, 4,000 feet, Gaspé; found by writer near Federal Lead and Zinc Mines, Matane Township, Gaspé, at 2,000 feet; reported by C. W. Dodge, (Rhodora Vol. 28, p. 205) on Tabletop, 4500 feet, and Mt. Albert, 3700 feet, on Shickshock Mountains, Gaspé; received from G. F. Dillman, from western Maine, Grafton township; from Vincent J. Schaefer, from Mount Marcy in the Adirondacks; from F. K. Vreeland, on Blue Mountain, 3500 feet, Adirondacks. More common northward than in the club range: *f. crispata*, a low, dense form, may be looked for with the species.
2. *C. sylvatica* (L.) Hoffman, In openings in spruce woods, in Gaspé National Forest; reported by C. W. Dodge, from the Tabletop Range, and Mount Albert, 3800–4500 feet, in the Shickshocks, Gaspé; from Vreeland, South Pond, Adirondacks; probably widely scattered, and sometimes mixed with *C. rangiferina*, in shade.
3. *C. mitis* Sandst. Not as common northward as in the sandy areas of the coast strip in club range, but probably to be looked for in sandy soil in southern and central Maine; reported by Allen on Cap Chat River, Gaspé.
4. *C. tenuis* (Floerke) Harm. Found by writer in Matane Township, Gaspé County, Quebec, at 1500 feet; received from Avery, Chairback Mountain, Maine; and Vreeland, South Pond, Adirondacks. Probably occasional in north.
5. *C. impexa* Harm. Var. *laxiuscula* Del. reported by C. W. Dodge, on the Tabletop Range, in Gaspé. To be looked for with other Cladinae in the north, not seen by nor received by writer.
6. *C. alpestris* (L.) Rabenh. Received from Avery, Mount Katahdin and Chairback Mountain, northern Maine; Schaefer, Mt. Marcy, Adirondacks; A. T. Shorey, Basin Mountain, Adirondacks; M. L. Joslin, Lincoln Mountain and Couching Lion, Vermont; Mrs. Laura Woodward Abbott, Jay Peak, Vermont; Blue Mountain, Adirondacks, Vreeland; E. H. Walker, Mount Washington. Common on open mountaintops in

the north and in exposed places at lower levels. Reported by C. W. Dodge on high summits in Gaspé. (Pl. 1, f. 1.)

7. *C. papillaria* (Ehrh.) Hoffm. Small form, *f. papillosa*, with small papilliform podetia, found by writer on Mount Monadnock, N. H., 3,000 feet; not seen in Gaspé, not listed by Allen or Dodge, probably to be looked for in thin soil over ledges or sandy places not far from the coast in Maine, or possibly inland, apt to be overlooked by amateur collectors because so inconspicuous. Dr. Evans has specimens collected by J. C. Parlin in Hartford, Me. Tuckerman reported the species in the White Mountains.
8. *C. Floerkeana* (Fr.) Floerke. Not seen by writer, nor received from north woods, but may be looked for, with *C. bacillaris* and *macilenta*. C. W. Dodge reports it in Matane township, Gaspé. Dr. Evans has it from J. C. Parlin from Hartford, in central Maine.
9. *C. bacillaris* (Ach.) Nyl. Found by writer in Gaspé National Forest, at 1500 feet, on road from New Richmond to Federal Mine; reported by Dr. C. W. Dodge on Logan Range and by Allen on Cap Chat River; received from Vreeland, South Pond, Adirondacks; Dillman, Santanoni Mountain, Adirondacks, and western Maine; Shorey, Cranberry Lake, Adirondacks; Dr. Evans has specimens from Maine, New Hampshire and Vermont; probably fairly common in north.
10. *C. macilenta* Hoffm. Var. *styracella*, the common form, found by writer in Gaspé National Forest, near Federal Mine, Matane Township, and reported from same township by Dodge. Dr. Evans has it from J. C. Parlin, Hartford, Maine. Probably not rare, to be sought with *C. bacillaris*.
11. *C. coccifera* (L.) Willd. A few podetia received from M. L. Joslin, from Lincoln Mountain, Vermont, at 4100 feet, were identified by Dr. Evans as the coarsely granulate *f. Stemmatina* Ach. which is reported by Dodge from three stations in the Shickshocks, Gaspé; Dodge also found *var. coronata* in the gorge of the River Sainte Anne des Months, in the Tabletop Range, Gaspé.
12. *C. pleurota* (Floerke) Schaer. Received from E. H. Walker, from Mount Washington, N. H. Dr. Evans has specimens from Nova Scotia, New Hampshire, Vermont and Maine. Probably occasional in north. Allen found on Mt. Logan, Gaspé, a single podetium which he describes in his paper in Rhodora, May, 1930, as very stout in appearance owing to dense, large squamules, with cup 1.5 cm. in diameter; Robbins regarded it as a foliose, aberrant form.
13. *C. digitata* Hoffm. Apparently widely scattered in the north woods. Received from Vreeland, South Pond, and Schaefer, Mount Marcy, Adirondacks; Avery, Chairback Mountain, Maine; found by writer in Matane Township, Gaspé National Forest; reported by Allen on Cap Chat River and by Dodge on the Logan Range: Dr. Evans has it from New Hampshire and Vermont. Tuckerman reported it from Greenland. We have lately received it from Dillman, from Wittenberg Mt., in the Catskills. If in doubt as between it and the next species, the intense yellow re-

action with KOH identifies *C. digitata;* the following has no reaction. (Pl. 1, f. 3.)

14. *C. deformis* (L.) Hoffm. Common, and sometimes in large, robust and conspicuous colonies, throughout the north woods, received from all of the collectors named, and reported by Allen and Dodge at several places in the mountains of Gaspé, where this writer found it frequent, especially along tote roads in Matane township.
15. *C. cristatella* Tuck. This common scarlet fruited Cladonia, endemic to North America, extends into the north woods and climbs to 4,000 feet or more. It was included, from stations 1500 to 4000 feet, in the collections of all of the contributors named, and is reported by Allen and Dodge at high altitudes in the mountains of Gaspé. The writer found the smooth form, *f. Beauvoisii*, in larger size than any seen in the club range, making a strikingly handsome plant, along old tote roads near the Federal Mine and Lake Ste. Anne, in the Gaspé National Forest. Allen and Dodge report *f. vestita* in Gaspé, and it occurred in most of the specimens received from the writer's friends from northern stations. Allen reported the brown fruited *f. ochrocarpa* on the Cap Chat River, and Dodge found the densely branching *f. ramosa* on the Logan Range.
16. *C. incrassata* Floerke. Received from Vreeland, South Pond, Adirondacks, about 1800 feet, but not from other collectors, nor found by writer northward. Dr. Evans has no specimens from north of Massachusetts. Fink reported it near Mankato, southern Minnesota (as *C. cristatella paludicola*, an older name). In the club range it is most plentiful in the New Jersey Pine Barren swamps and on Long Island, with one station on Wawayanda Mountain, 50 miles inland. Search should be made for it in usual stations on rotten wood in swampy forests, northward, perhaps not far from coast, to endeavor to extend its range.
17. *C. uncialis* Floerke. Received from Vreeland, Blue Mountain, Adirondacks; Avery, Chairback Mountain, Maine; found by writer on Mount Monadnock, N. H.; mostly near *f. dicraea*, the form of exposed places in the club range; this form reported by Dodge on the Logan Range in Gaspé. Probably not rare in north.
18. *C. caroliniana* (Schwein) Tuck. Received from Joslin, Vermont; found by Merrill, near Rockland, Me.; not reported by Allen or Dodge, nor seen by writer, in Gaspé; Tuckerman reports it "throughout North America," including Newfoundland and the Arctic regions, as well as far south. Its prevalence in the club range in the sandy regions on Long Island and in the Pine Barrens of New Jersey suggests it might be looked for in similar regions in southern or central Maine, or Nova Scotia.
19. *C. Boryi* Tuck. Merrill found this at Rockport, Maine; and Dr. Evans has received it from Parlin, Hartford, Maine. Tuckerman reported it from the White Mountains, Newfoundland and Labrador. Its ample and robust occurrences on Montauk Point, Long Island, in our club range, suggest it may be looked for in similar places northward along or not far from the coast.
20. *C. amaurocraea* (Floerke) Schaer. This arctic-alpine species ranges from

the higher White Mountains and the northern shore of Lake Superior to Arctic America, being one of the most northern ranging Cladoniae. Allen reported it from the summit of Mount Logan, about 3700 feet. Dodge does not report in Gaspé. Dr. Evans calls attention to the fact that, according to Merrill, it was found by Miss Cummings on Mt. Moosilauke, N. H. It has lately been received from J. L. Lowe, who found it on Mt. Marcy in the Adirondacks.

21. *C. furcata* (Huds.) Schrad. Commoner forms, *var. racemosa, f. corymbosa* (Ach.) Vainio; var. *pinnata, f. foliolosa* (Del.) Vainio, were in collections received by the writer and made by himself, in the north woods; also, *var. racemosa, f. fissa*, with extremely fissured podetia, from Dillman, Schroon Lake region, and Santanoni Mountain, Adirondacks; *var. racemosa, f. furcatosubulata*, from Schaefer, Mount Marcy, which are distinctly more northern, although Dr. Evans found them in northwestern Connecticut. *Var. racemosa* reported by Allen on Mount Logan, Gaspé. The species, in several forms, is common northward.

22. *C. scabriuscula* (Del.) Leight. *F. farinacea*, found by writer in Gaspé; reported (?) as *C. furcata, f. scabriuscula* (Del.) Coem, by Dodge, on Mount Logan, Gaspé. Dr. Evans has it from Grand Manan Island, collected by Weatherby, and from various localities in Maine and New Hampshire. Specimens of *ff. surrecta* and *elegans* Robbins were collected by Robbins at Jackson, N. H. Probably occasional in high forests in north.

23. *C. multiformis* Merrill. *F. Finkii* (Vainio) Evans, with cups, found by writer near Tupper Lake, Adirondacks; received from Dillman, Santanoni Mountain, Adirondacks. Species reported on Mt. Logan, Gaspé, by Allen. Dr. Evans has it from Maine, New Hampshire and Vermont. Merrill lists numerous Maine stations in the Bryologist, January, 1909. *F. subascypha* (Vainio) Evans, with cups abortive or lacking, received from Thomson, from Harrison, Me. Probably not rare in north. (Pl. 3, f. 2.)

24. *C. crispata* (Ach.) Flot. *Forma infundibulifera*, with extensively proliferate podetia, seems to be the common form of this species in the north woods; found by writer in Matane Gaspé; received from Dillman, Santanoni and McIntyre Mountains, Adirondacks; and Old Speck Mountain, western Maine; and from Joslin, Lincoln Mountain, Vermont. (Pl. 2, f. 2.)

25. *C. squamosa* (Scop.) Hoffm. Common northward, in several forms, and usually more robust than in club range, including *ff. denticollis, phyllocoma, levicorticata, m. rigida;* probably others; *f. murina* from Vreeland, South Pond, Adirondacks; one or more forms included in collections from contributors named, and seen by writer in Adirondacks, Maine and Gaspé. Reported by Allen and Dodge on Mount Logan, Gaspé (above 3,000 feet); from Mount Marcy, Adirondacks, by Schaefer, at nearly 5,000 feet.

26. *C. cenotea* (Ach.) Schaer. *Forma crossota*, short and cylindrical, found by writer in Gaspé, near Federal Mine; reported by Dodge on Logan

Range, Gaspé; *f. prolifera*, with taller cups, with rather long proliferations found by writer in Gaspé; *f. exaltata*, longer, with two or three ranks of cups, received from Dillman, Old Speck Mountain, western Maine. (Pl. 2, f. 4, 6, 7.)

27. *C. delicata* (Ehrh) Floerke. *F. quercina* received from Vreeland, South Pond, Adirondacks; received from Parlin, Canton, Me., by Dr. Evans. Northern records are scarce and this species should be sought for by students with opportunities to do so, to locate possible northward extensions.
28. *C. caespiticia* (Pers.) Floerke, received from Thomson, Harrison, Me., Vreeland, South Pond, Adirondacks; found by writer in Matane, Gaspé; reported at South Thomaston, Me., by Merrill and received by Dr. Evans, from Parlin, Hartford, Me. Probably not rare in north but overlooked because of inconspicuous subsessile apothecia.
29. *C. turgida* (Ehrh.) Hoffm. *F. corniculata* (Pl. 3, f. 8) with large primary squamules and robust podetia, with cupped or subulate branches, common in Adirondacks from frequency in collections received from Vreeland, Dillman, Schaefer and Shorey. *F. scyphifera* reported by Dodge in Gaspé.
30. *C. cariosa* (Ach.) Spreng. *F. cribrosa* found by writer along tote road, near Federal Mine, Matane Township, Gaspé. *F. cribrosa* and *f. corticata* found by Allen on Cap Chat River, Gaspé; Species reported by Dodge at Cap Rosier, Fox River, at eastern tip of Gaspé peninsula. (Pl. 3, f. 5.)
31. *C. sub cariosa* Nyl. Received from Vreeland, open fields around South Pond, Adirondacks; not from collections of higher forests or mountaintops; not in Dodge's or Allen's Gaspe lists; found by Merrill at Thomaston, Me., on coast; may extend in lower elevations into northern New England.
32. *C. decorticata* Floerke. (Pl. 2, f. 5), found by the writer near Federal Mine, Matane, Gaspé.
33. *C. verticillata* (Hoffm.) Schaer. *F. evoluta* (Th. Fr.) Stein., found by writer near Jackman, Me., and in Matane, Gaspe; received from Vreeland, South Pond, Adirondacks; probably scattered in relatively lower elevations northward.
34. *C. degenerans* Floerke. (Pl. 1, f. 6). Received from Dillman, McIntyre Mountain, Adirondacks; Dr. Evans has specimens from Maine, New Hampshire and Vermont.
35. *C. gracilis* (L.) Willd. Common northward, various forms received from all the collectors named. Found by writer near Tupper Lake, Long Lake and Speculator, in Adirondacks; near Jackman, Me., and in Matane, Gaspé; reported by Allen and Dodge in valleys in Gaspé; common variety *dilatata* (Hoffm.) Vainio, with stout, smooth podetia, and its forms *anthocephela* (Floerke) Vainio, with squamulose podetia, and *dilacerata*, (Floerke) Vainio, with irregular squamulose cups may be looked for in colonies of the species. *F. chordalis*, with slender erect cylindrical podetia terminating in long points, or with small cups bearing acuminate pro-

liferations also occurs. From Avery, from Chairback Mountain was received *var. elongata* (Jacq.) Hoffm. tallest and most robust form of the species, some podetia five inches tall, with irregular cups and large apothecia, or with acuminate tips. This is reported by Allen and Dodge in the mountains of Gaspé. (Pl. 2, f 1.)

36. *C. pyxidata* (L.) Hoffm. Reported by Fink in Minnesota; Dodge seems to include *C. pyxidata* and *C. chlorophaea* under the former, listing several occurrences in Gaspè.
37. *C. chlorophaea* (Floerke) Spreng. As used by Dr. Evans (see earlier paper by this writer) this species and its several forms, is very common in the north and was frequently sent by all the collectors named. Allen reported it, without giving form, in the Cap Chat River Valley, and on Mount Logan; Dodge, as forms of *C. pyxidata*, in several places in the interior of Gaspé. Most of the forms listed by Dr. Evans, in the Cladoniae of Connecticut, and in the writer's earlier paper, occur in material seen or received from northern regions.
38. *C. conista* (Ach.) Robbins. A few podetia found by writer near Federal Mine, Gaspé; reported by Allen on the Cap Chat River; probably occasional in north; to be looked for with *C. chlorophaea*.
39. *C. fimbriata* (L.) Fr. F. major, (Hagen) Vainio, a few podetia found by writer near Tupper Lake, Adirondacks; presumably same form, with large cups, reported by Dodge, as *var. simplex, f. major*, in Gaspé. Dr. Evans has "the true fimbriata" from Maine (Parlin) and also from New Hampshire and Vermont. He writes that he will have a note on *C. major*, "which Sandstede keeps distinct," in a paper he is preparing, on additions to the Cladoniae of Connecticut, for Rhodora. This is scarce and material would be welcomed by Dr. Evans and this writer. As understood by the writer, it is like *C. chlorophaea*, but with larger and more flaring cups. (Pl. 3, f. 7.)
40. *C. nemoxyna* (Ach.) Nyl. Much more common northward than in club range; *f. fibula* found by writer in Matane, Gaspé; reported by Allen on Cap Chat River and Mount Logan; received from Dillman, Santanoni and McIntyre Mountains, Adirondacks.
41. *C. cornutoradiata* (Coem.) Vainio. Reported by Allen, also *f. subulata*, in the valley of Cap Chat River, Gaspé.
42. *C. cornuta* (L.) Schaer. Received from Avery, Chairback Mountain, Maine; reported by Dodge, Baker's Woods, Gaspé.
43. *C. coniocraea* (Floerke) Sandst. Common everywhere in favorable conditions in the north; *f. ceratodes*, with subulate tips, most frequent; *f. truncata*, with small narrow cups occasional.
44. *C. borbonica* (Del.) Nyl. *F. cylindrica*, received by Dr. Evans from four localities in Maine, from Parlin. May be looked for northward. Reported by Allen in valley of Cap Chat River. Found by writer in club range since publication of earlier paper.
45. *C. pityrea* (Floerke) Fr. Dr. Evans has specimens from Maine and Vermont and it may be looked for northward.

46. *C. strepsilis* (Ach.) Vainio. Received by Dr. Evans, from Buckfield, Me., from Parlin; not listed in other papers cited; may be looked for northward not far from coast, perhaps.
47. *C. ochrochlora* Vainio. Received from Vreeland, South Pond, Adirondacks, and Thomson, Harrison, Me.; received from Dr. Evans from Maine, also from New Hampshire.
48. *C. botrytes* (Hag.) Hoffm. Found by writer on bark of dead spruce, beside road to Federal Mine, Matane Township, Gaspé National Forest, 48 miles north of New Richmond on the Bay of Chaleur. Listed by Fink in Minnesota and by Tuckerman from British Columbia; not in Allen's or Dodge's Gaspé lists; probably to be looked for northward on bark of dead conifers. Found by J. L. Lowe on Mt. Marcy in the Adirondacks. (Pl. 2, f. 3.)

Since making up the above lists, the writer has received a very interesting collection of lichens, collected from above timber line on Mount Marcy, in the Adirondacks, from Mr. J. L. Lowe, of the State College of Forestry, Syracuse University, who is revising the Cladoniae for Prof. Fink's posthumous Manual of North American Lichens. Among them are two Cladoniae of note. One is *C. amaurocrea*, No. 20 in the above lists; the other *C. cyanipes*, which is described by Tuckerman, as *C. carneola*, *b. cyanipes*, with podetia "membranaceous-corticate soon becoming powdery, slender, fragile, from simple soon sparingly and irregularly short-branched; the cups disappearing in subulate branchlets."

Note: There is some question as to the exact identity of Fig. 4 and Fig. 7, on Plate 3. Dr. Evans first thought Fig. 4, *C. cornuta*, but it lacked soredia. Dr. Sandstede named it *C. gracilis, var. elongata*, but Dr. Evans now thinks it more like *C. gracilis. var. chordalis*. On his advice we follow Sandstede for the present. It may be an immature specimen, with character indeterminate. Fig. 7 is called *C. fimbriata, f. major* here, although Dr. Evans is calling a like plant *C. major*, in a second series of Notes on the Cladoniae of Connecticut, to appear in Rhodora, but admits difficulty in distinguishing *C. major* from *C. fimbriata*, "the only morphological difference being in size."